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Ask Tom! Column

New Aeration Technology Improves Oxygen Transfer

Guest article by Mike Meyer, Mazzei Injector Corporation

The Activated Sludge Process has been employed for human waste treatment for over one hundred years. Many variations of the process have been employed to optimize it for the specific applications. Regardless of the specific configuration of the process, the Activated Sludge Process employs microorganisms to assimilate and digest organic carbon compounds in the influent wastewater stream. The microorganisms can range from simple single cell bacteria to more complex life forms such as protozoa.

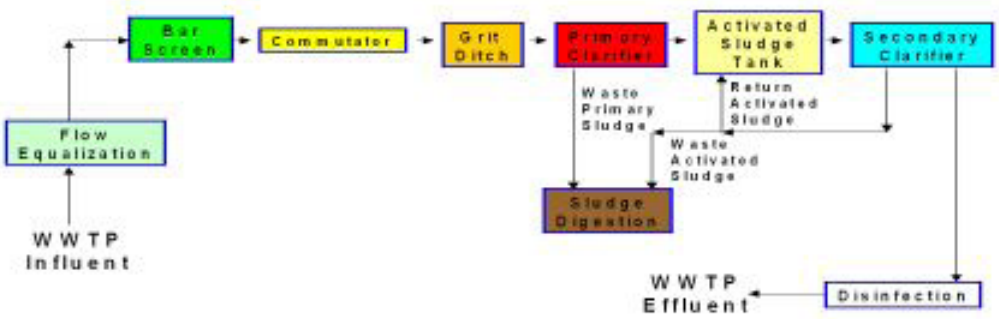
The role of aeration in the activated sludge process is to provide oxygen to the microorganisms as they assimilate the organic carbon compounds and digest a portion of them to carbon dioxide and water, Sulfate and Nitrate compounds. The remaining waste solids are changed to a form that can be settled and removed as sludge by sedimentation.

WWTP Processes

Regardless of the configuration of the Activated Sludge Process, Biological Treatment and Secondary Clarification (for MLVSS concentration) and sludge wasting must be included. In addition, WWTP's may employ the follows processes:

- Influent Gross Solids Removal - Bar Screening
- Solids Grinding - Commutators
- Flow Equalization - Equalization Tank
- Grit Removal - Grit Ditch Primary
- Clarification - Primary Clarification Tank
- Sludge Digestion - Anaerobic or Aerobic
- Disinfection - Chlorination, UV, Ozone

Following is a generalized flow diagram for a conventional Activated Sludge WWTP:



Conventional Activated Sludge WWTP

There are many processes used for aeration in the activated sludge process. The more commonly employed are coarse of fine bubble diffusion, surface aerators, brush aerators, jet aeration and venturi aeration systems. Bubble diffusion processes can be highly efficient but limited water depths of less than 20 feet, and noisy blowers/compressors are required. Surface aerators and brush aerators can also be highly efficient but do not mix deep tanks or basins effectively. Jet aeration is energy-efficient and mixes well, however blowers or compressors are required.

Venturi Injectors

The Mazzei AirJection aeration process utilizes special venturi injectors in conjunction with nozzles, for aeration of wastewater. The AirJection Process is composed of three basic units:

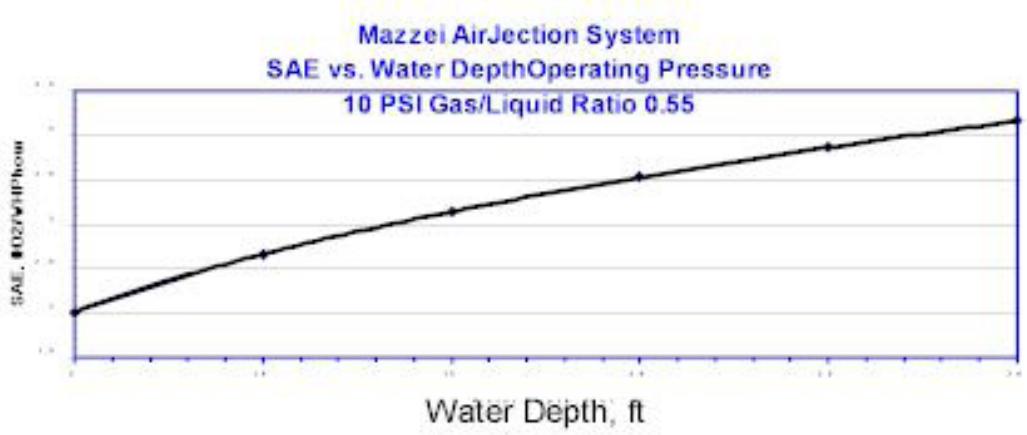
Circulation Pump

High Efficiency Venturi Injector

MTM Nozzles

The process has been thoroughly tested, with both clean water & process (dirty) water following standards and guideline established by the American Society of Civil Engineers (ASCE). The results of this testing have been certified by a licensed professional engineer. The data resulting from this testing have been incorporated into design spreadsheets which facilitate accurate & quick system design.

The Airjection process is unique in that the energy efficiency (Standard Aerator Efficiency, SAE) increases with increasing water depth as demonstrated in the following chart:



A critical aspect of activated sludge process design is estimation of the process (dirty water) oxygen transfer from clean water test results. Under estimation of the process water transfer will result in inadequate aeration, while over estimation will result in unnecessary (and costly) energy expenditure. The ratio of dirty water transfer to clean water transfer is known as the Alpha factor.

An Alpha of 0.5 would mean that the dirty water transfer under a given set of operating condition would be 50% of the transfer in clean water. Alpha factors from as low as 0.3 for fine bubble diffusion, to as high as 0.85 for low speed surface aerators have been reported. Extensive Dirty water transfer testing has shown the Alpha Factor for the Airjection Process to be equal to or greater than ≥0.90 in nearly all cases.

Conclusion

The oxygen transfer capability of the AirJection aeration process has been thoroughly tested in both clean and process water. The results of this testing have been compiled into design spreadsheets which facilitate fast and accurate system design. The versatile nature of the process affords ease of installation for a wide array of aeration tank/pond configurations. The lack of blowers or compressors affords installation in environments where noise is an issue.

About Our Author

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Welcome to Ask Tom!, a monthly column by our resident water treatment guru, Tom Keenan of National Environmental Services Agency (NESA). Tom addresses the issues that bug you the most. And Tom knows!! With 35 years experience in providing environmental support services to public and private sector clients on a wide range of environmental issues.

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Guest articles for the **Ask Tom!** Column are always welcome, for more information please contact Tom Keenan directly at his email address: info@nesa.ie